

TWO NEW LARVAL MITES (ACARINA: ERYTHRAEIDAE) ECTOPARASITIC ON NORTH QUEENSLAND CICADAS

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Two new larval mites are described, ectoparasitic on cicadas from Cape York Peninsula, Queensland: *Leptus torresianus* sp. nov. on *Venustria superba* Goding & Froggatt and *Tamasa doddi* Goding & Froggatt; *Caeculisoma mouldsi* sp. nov. on the same two species of cicadas and also on *Mardalana suffusa* Distant and *Psaltoda fumipennis* Ashton. *Leptus torresianus* larvae were attached to the denser chitin of the cicadas (first leg tibiae). Most *Caeculisoma mouldsi* larvae were attached to the wing veins, on both surfaces of both pairs of wings.

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Erythraeid larval mites attach as ectoparasites to a wide variety of terrestrial arthropods (insects, collembolans, arachnids) (Oudemans 1912; Southcott 1946, 1961b; Greenslade & Southcott 1980; Welbourn 1983). Various host usages of cicadas have been recorded. Ishii (1953) recorded that *Leptus kyushuerensis* Ishii (Leptinae) parasitized three species in Japan: *Graptosaltria colorata* (Stål), *Meimuna opalifera* (Walker) and *Platypleura kaempferi* Matsumura; from New Zealand *Momorangia jacksoni* Southcott (Callidosomatinae) was recorded from *Melampsalta oromelaena* Meyers, and *Momorangia vallata* Southcott was recorded from *Melampsalta oromelaena* and *Melampsalta* sp. (Southcott 1972); Welbourn (1983: 138) recorded *Leptus* sp. on *Mugicicada septendecim* (L.) in the United States.

Various erythraeid mite larvae have been found on other Homoptera e.g. in the families Aleyrodidae, Aphididae, Cercopidae, Cicadellidae, Delphacidae, Fulgoridae, Membracidae, Psyllidae (e.g. Oudemans 1910, 1912; Pussard & André 1929; Southcott 1946, 1961b, 1966, 1972; André 1951; Kawashima 1958, 1961a, b; Smiley 1968; Sömermaa 1973; Tseng *et al.* 1976; Yano & Ehara 1982; Welbourn 1983; Young & Welbourn 1987).

Mr M.S. Moulds, Sydney, N.S.W., observed (pers. comm. 1987) small red mites parasitizing cicadas in north Queensland, and forwarded six pinned cicadas. Five of them had dried mites attached to the legs, wings and thorax, which represent two undescribed species of Erythraeidae larvae. These are described below as *Leptus torresianus* sp. nov. and *Caeculisoma mouldsi* sp. nov. (Fig. 1 A-D shows a cicada and mites *in situ*).

Seta and other terminology follows Southcott (1961a, b, c; 1963, 1972). All measurements are in micrometres (μm) unless otherwise stated. Two new shield measurements AAS and LX are introduced

here. AAS is the distance between centres of bases of AL scutula and ASens of the same side. LX is the distance of the levels of the AL scutulae behind the anteromost point of the scutum. (see Figs 2A-E). These measurements introduce a slight redundancy, since

$$\text{AAS}^2 = \left(\frac{\text{AW-SBa}}{2} \right)^2 + (\text{ASBa-LX})^2$$

assuming perfect symmetry. Nevertheless, they appear useful in specific diagnoses of erythraeid mites.

The types of both species are deposited in the South Australian Museum.

Genus *Leptus* Latreille, 1796

For synonymy see Southcott (1961b: 514).

Diagnosis (for larva)

See Southcott (1961b: 514).

Remarks

This is a cosmopolitan genus, with many species having been described as adults, and others as larvae. Although in some cases correlation between larvae to deutonymphs had been recorded (Southcott 1961b: 517-521), a full correlation of a larva to the deutonymph and adult in *Leptus* (an unidentified North American species) was achieved only in 1973, by Treat (1975).

Larvae parasitize a wide variety of terrestrial arthropods (Oudemans 1912; Southcott 1961b, 1984; Treat 1975; Welbourn 1983).

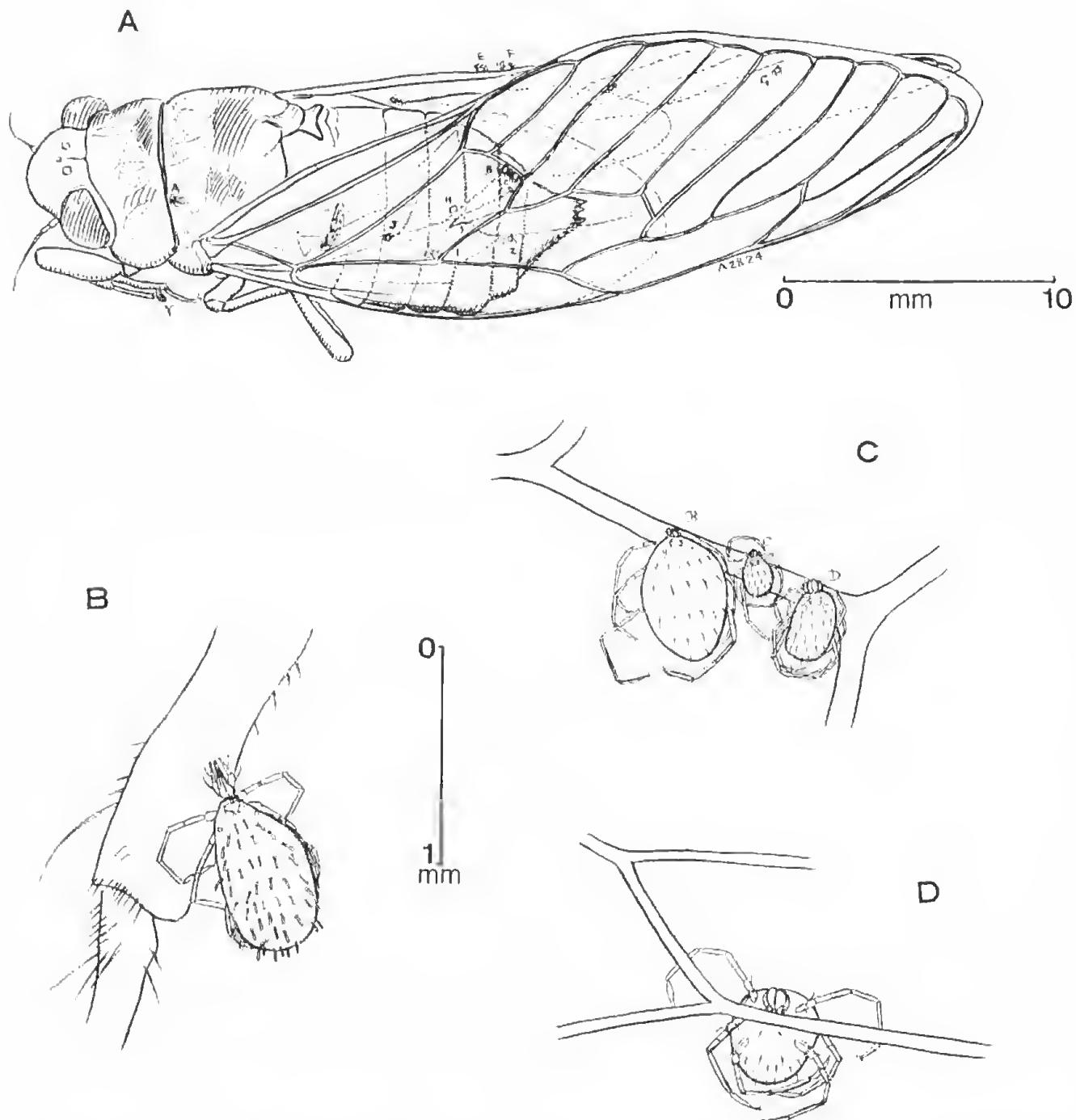


FIGURE 1. North Queensland cicada and its ectoparasitic mites. A, cicada, *Venustria superba* G. & E., A2824, preserved dry, with ectoparasitic larval erythraeid mites *in situ*, serials ACA2308, 2309. Mite Y, attached to right tibia. *L* is *Leptus torresianus* sp. nov., holotype, ACA2308. Other mites are *Caeculisoma mouldsi* sp. nov., ACA2309 series; mite J, attached to inferior surface of left hind wing is holotype of *C. mouldsi*. B, holotype of *L. torresianus*, attached to lateral end distally of right tibia. C, mites, *C. mouldsi*, specimens ACA2309B, C, D attached to vein of dorsal surface of left anterior wing. D, mite ACA2309Z, *C. mouldsi*, seen in transparency, attached to wing vein on inferior surface of left posterior wing. All drawings to nearest scale.

***Leptus torresianus* sp. nov.**
(Figs 3A, B, 4A, B, 5)

Description of Larva (principally holotype, supplemented by paratypes)

Colour in dried state red. Idiosoma (mounted) of normal ovoid shape for genus, length (partially

fed) 897, width 498, overall length from tip of mouthparts to posterior pole of idiosoma 1118.

Dorsal scutum moderately sclerotized, and forms approximately an equilateral triangle. Central part of its anterior border produced to a low protuberance, containing the anterior sensilla. Lateral borders short, sloping anterolaterally. Posterolateral

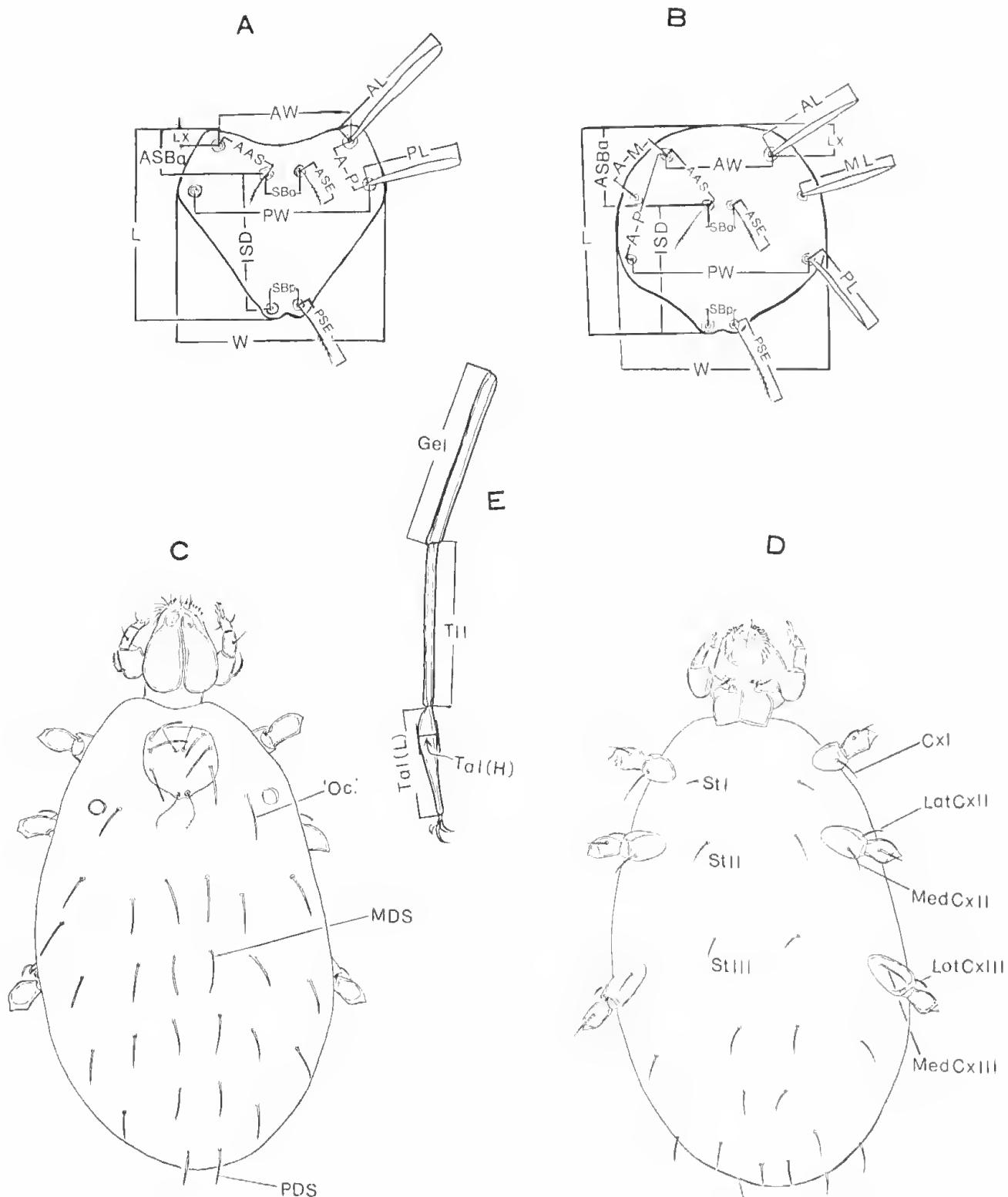


FIGURE 2. Explanatory diagrams for conventions of abbreviations and measurements used for the larval erythraeid mites. A, dorsal scutum of a larval erythraeid mite with two pairs of scutalae (*Leptus*). B, dorsal scutum of a larval erythraeid mite with three pairs of scutalae (*Caeculisoma*). C, dorsal view of *Caeculisoma* sp., with legs omitted beyond trochanters. Oc. 'ocular seta'; MDS mid-dorsal setae; PDS posterior dorsal setae.

borders concave. Posterior pole of scutum rounded, enclosed in two narrow bars of chitin not meeting in the middle. Scutal scobalae curved, blunted, a little clavate, with dense covering of short, pointed, pigmented setules. Sensillary setae filiform, with fine setules distally.

Standard and other data of scutum and legs as in Table 1.

Eyes circular, 1+1, posterolateral to scutum, 24 across.

Dorsum of idiosoma with 50 setae, slightly clavate, with pigmented but only slightly outstanding setules; setae arranged approximately 4, 6, 8, 8, 8, 4, 4.

Ventral surface of idiosoma: sternalae I bushy, blunted, more or less parallel-sided, sternalae II similar, 40 long; between levels of coxae II and III are four setae, anterior pair (sternalae III) bushy, expanding, 26 long, and posterior pair (sternalae IV) more medial, bushy but more slender, 42 long.

TABLE 1. Standard data for *Leptus torresianus* sp. nov. larvae.

Character	Holotype ACA2308	Paratype ACA2311A	Paratype ACA2311B	Mean
AW	102	92	94	96
PW	114	102	108	108
SBa	15	12	13	13.3
SBp	16	15	13	14.7
LX	13	24	14	17
ASBa	9	36	16	20.3
ISD	48	39	58	48.3
L	76	73	84	77.7
W	121	111	115	115.7
AAS	42	38	40	40
A-P	16	16	19	17
AL	62	58	64	61.3
PL	c.65	67	67	66.3
ASE	c.30	31	33	31.3
PSE	c.60	c.55	46	53.7
DS	45-58	38-58	51-56	57.3*
'Oc.'	45	42	47	44.7
MDS	53	49	55	52.3
PDS	58	58	56	57.3
Gel	160	155	158	157.7
Til	230	228	226	228
Tal(L)	162	165	—	163.5
Tal(H)	21	20	—	20.5
Til/Gel	1.44	1.47	1.43	1.45
GelII	130	122	140	130.7
TilII	199	195	—	197
TalII(L)	140	138	—	139
TalII(H)	20	20	—	20
GelIII	155	139	155	149.7
TilIII	288	267	288	281
TalIII(L)	160	156	157	157.7
TalIII(H)	20	21	22	21
TilIII/GelIII	1.86	1.92	1.86	1.88
AW/ISD	2.13	2.36	1.62	2.04
ISD/A-P	3.00	2.44	3.05	2.83
AW/A-P	6.38	5.75	4.95	5.69
StI	42	38	44	41.3
CxI	83	73	—	78
CxII	c.22	25	—	23.5
CxIII	40	c.40	48	42.7
Til/AW	2.25	2.48	2.40	2.38
TilIII/AW	2.82	2.90	3.06	2.93
TilII/Til	1.25	1.17	1.27	1.23
AW/AL	1.65	1.59	1.47	1.57
AL/AAS	1.48	1.53	1.60	1.54

*For the maxima of DS

Between and behind coxae III 16 setae, 38–50 long, arranged 4, 4, 6, 2; setae well setulose, blunted, slightly expanding, posteriors tending to be more clavate and resembling posterior dorsal idiosomalae. Coxalae I, I, I, arising as figured, Coxala I parallel-sided, terminally tapering to a blunted point, and carrying many fine, pointed setules; coxalae II, III blunted, well setulose, somewhat clavate.

Legs normal; lengths (including coxae and claws) I 935, II 860, III 1015.

Leg specialized sensory setae (lengths in parentheses): SoGeI.42d(29), SoGeI.59d(29), VsGeI.92d(6), SoTiI.66d(35), SoTiI.75d(42), SoTiI.87d(25), VsTiI.89pd(5), VsGeII.91pd(9), SoTiII.04d(29), SoTiII.88d(23), SoTiII.03d(36).

Tarsus I with SoTaI.62d(38); tarsus II with SoTaII.42d(18). Tarsal claws: anterior almost straight with terminal ventral hook; middle longest, falciform, smooth; posterior recurved, with ventral setules (see Fig. 3).

Gnathosoma: chelicerae with rounded posterior element to bases, smooth, tapering to long anterior projections; length 205, maximum width of bases 122; ventral surface with faint transverse striations. With two pairs of hypostomalae, pointed, nude; anterior dorsal, 20 long, posterior ventral (also near tip of hypostome) c. 60 long. Palpal setal formula 0, 0, 1, 1, 3, 7. Palpal femoralia and genuala well setulose, tapering, pointed, not clavate, tibialae setulose. Palpal supracoxala not identified. Palpal tibial claw smooth, with a single terminal hook.

Material examined

Holotype: Queensland: C.R.E.B. [a Queensland Regional Electricity Board] Road, nr Mt Hartman, N. of Daintree, 2.i.1984, M.S. & B.J. Moulds, in rainforest; larva attached to lateral aspect of distal end of R. tibia I of cicada *Venustria superba* Goding & Froggatt (A2824) (see Fig. 1A, B), N1987194 (ACA2308).

Paratypes: Mt Hartley, nr Roseville, S. of Cooktown, 1.i.1984, M.S. & B.J. Moulds; on distal end of R. tibia I of cicada *Tamasa doddi* (Goding & Froggatt) (A2826), two larvae N1987195 and N1987196 (ACA2311A, B).

Remarks on taxonomy

Leptus torresianus sp. nov. is placed in the group of *Leptus* larvae with one femoral seta and one genual seta on the palp, which includes the majority of described members of the genus. However it differs from all described larvae with the preceding character set in having two specialized sensory setae (spinaliae or solenoidalae) on leg genu I. All others of this group have only one spinogentuala, except *L. stieglmayri* (Oudemans, 1905) from Brazil, which has five (Oudemans 1912: 165). Some other *Leptus* larvae have two or more such setae on genu I, but

they also have two palpal femoral setae (scobalae) — these being *L. echinopus* Beron, 1975, from Bulgaria, with five spinaliae on genu I, and *L. southcotti* Beron, 1975, from Bulgaria, with two spinaliae on genu I.

Remarks on biology

Leptus larvae appear generally to prefer hard, heavily chitinized parts of their hosts on which to attach by their mouthparts e.g. tibia in the case of *L. torresianus*. Treat (1975: 224) has also commented on this preference of an unnamed North American larval *Leptus* for an externally exposed sclerotized area: 'There is no seeking of soft membranes or crevices'. They are presumably able to utilize a small apparently mobile tooth on the tip of the cheliceral digits (see Fig. 4B) as a gouging or boring piece.

Etymology

The specific name is from the Torresian region of northern Australia.

Genus *Caeculismoma* Berlese, 1888

For synonymy see Southcott (1961b: 524, 1972: 25).

Diagnosis (for larva)

See Southcott (1972: 25).

Caeculismoma mouldsi sp. nov. (Figs 6A–C, 7A, B, 8)

Description of larva (principally from holotype, supplemented by paratypes)

Colour in dried state red. Idiosoma (mounted) of normal ovoid shape, length (partially fed) 600; width 385; overall length from tip of mouthparts to posterior pole of idiosoma 710.

Dorsal scutum approximately oval, with slightly concave anterior margin and rounded anterolateral angles. Anterolateral borders almost straight; postero-lateral borders evenly rounded. Posterior sensillary bosses protrude a little at posterior pole of scutum. Scutalae curved, tapering, blunted, lightly setulose with adnate setules. Sensillary setae filiform, with a few distal setules.

Standard data as in Table 2.

Eyes 1+1, circular, 22 across.

Dorsal idiosoma setae curved, tapering, pointed, with a few adnate setules; arranged 2, 7, 6, 6, 4, 4, total 29.

Ventral surface of idiosoma: sternale curved, tapering, pointed, with a few setules; II 40 long, III 36. Behind coxae III about 12 similar setae, 33–38 long, arranged 4, 4, 2, 2. Coxala I slender, tapering,

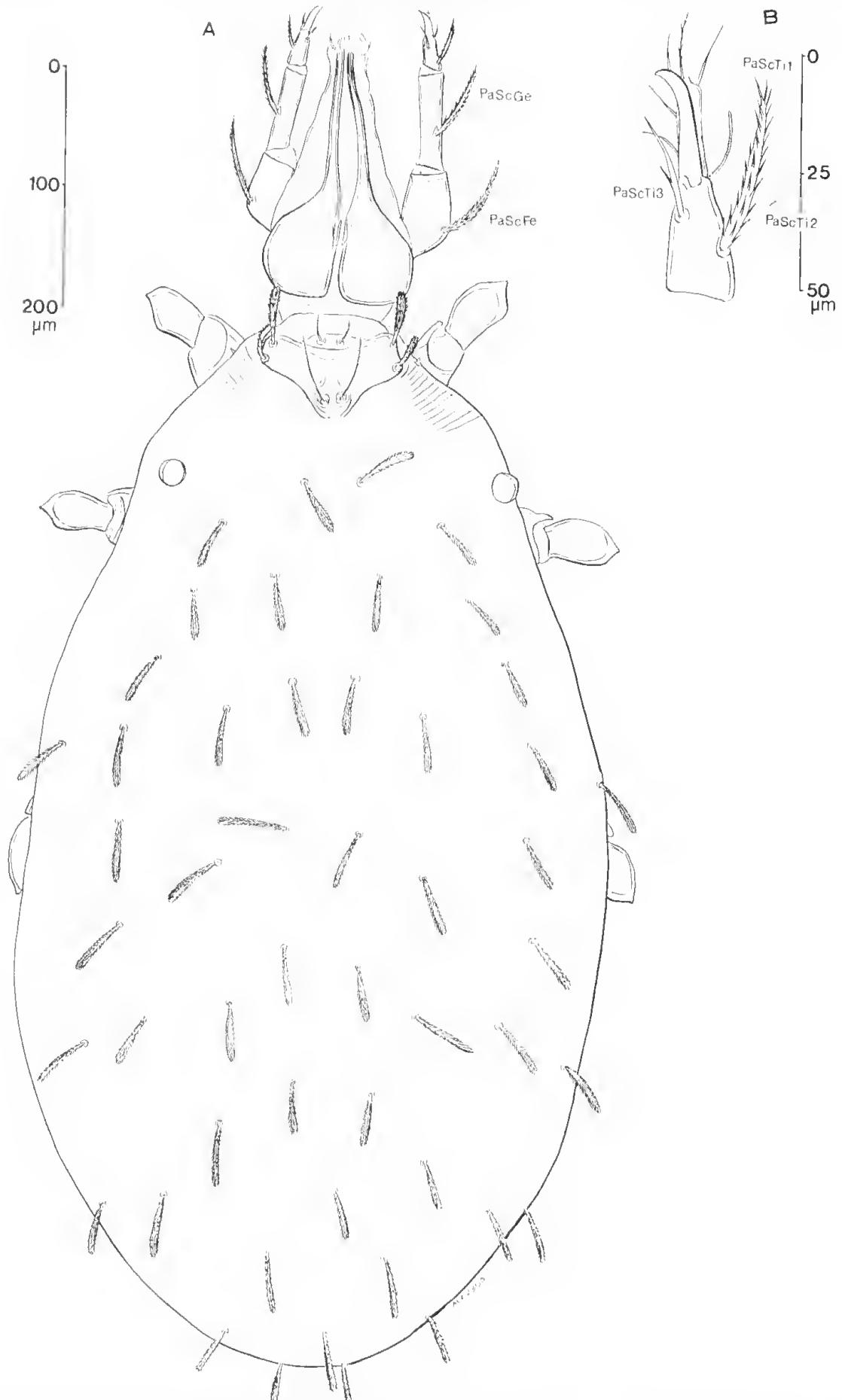


FIGURE 3. *Leptus torresianus* sp. nov., larva, holotype. A, dorsal view, legs omitted beyond trochanters. B, palpal tibia and tarsus, dorsal view. (Each to nearby scale.)

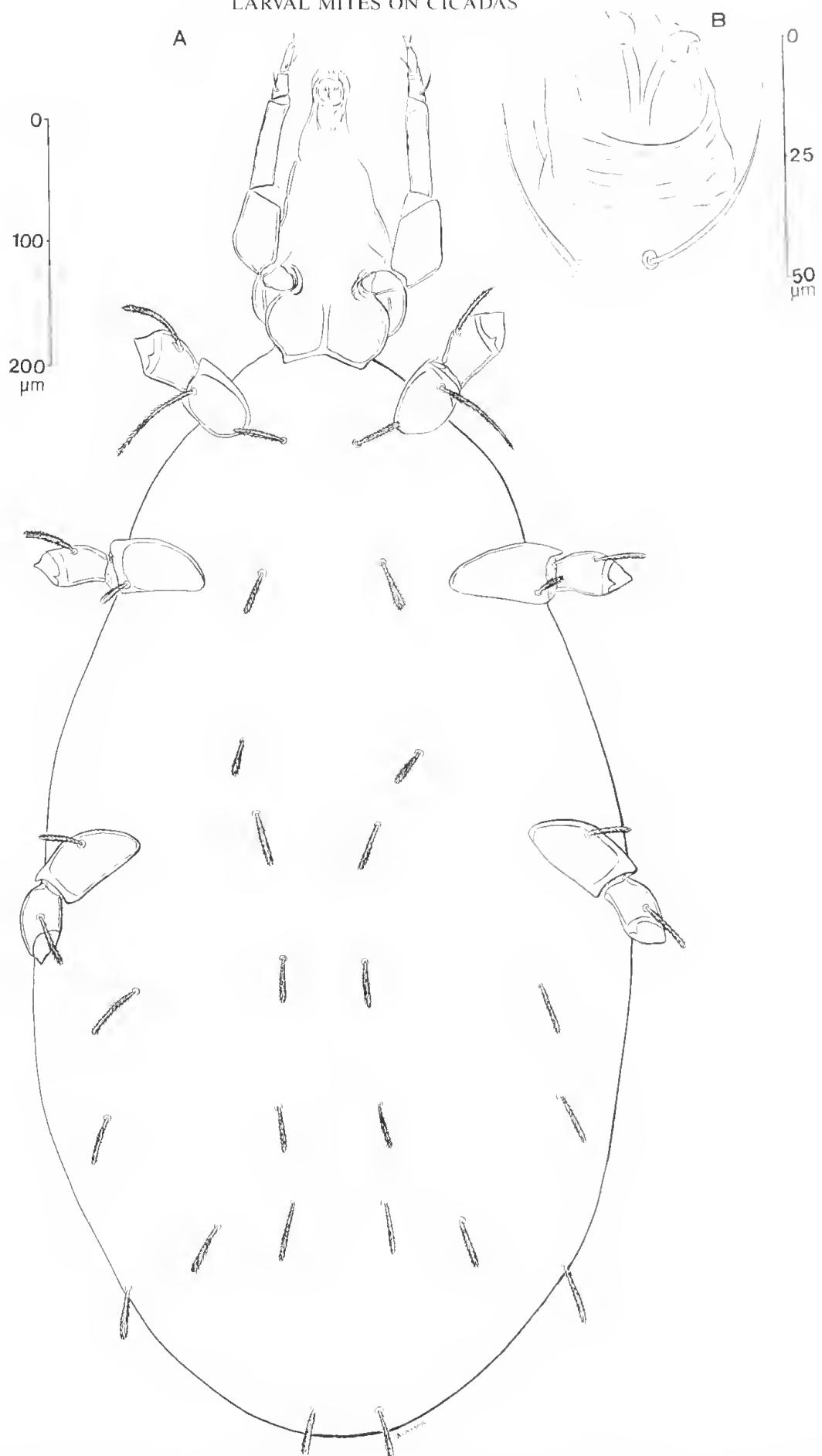


FIGURE 4. *Leptus torresianus* sp. nov., larva, holotype. A, ventral view, legs omitted beyond trochanters. B, tip of gnathosoma, ventral view. (Each to nearby scale.)

TABLE 2. Data on larvae of *Caeculisoma mouldsi* sp. nov.

Character	Holotype	n	range	mean	s.d.	c.v.
AW	68	43	58-75	68.33	3.3432	4.8931
MW	77	43	72-82	77.16	2.7683	3.5876
PW	76	45	69-80	76.11	2.4423	3.2088
SBa	9	46	7-11	9.13	0.9800	10.7333
SBp	14	48	11-15	13.81	0.9600	6.9500
LX	7	38	5-9	6.24	1.1954	19.1660
ASBa	29	38	24-33	28.50	2.3452	8.2288
ISD	61	41	48-66	57.24	3.4408	6.0108
L	95	38	84-100	92.21	3.9808	4.3170
W	96	44	87-101	93.25	3.1852	3.4157
AAS	35	41	34-41	36.00	1.3038	3.6218
A-M	17	46	14-22	17.50	1.9061	10.8922
A-P	45	46	37-50	43.63	2.9010	6.6491
AL	54	33	35-56	48.18	5.2408	10.8771
ML	58	41	44-64	53.90	5.1176	9.4943
PL	56	45	38-56	47.18	4.1522	8.8011
ASE	44	44	35-49	41.59	3.1425	7.5557
PSE	67	41	55-68	63.37	3.0146	4.7574
DS	40-63	50	47-64*	56.43	4.0466	7.1712
Oc.	63	49	47-64	56.61	4.0353	7.1280
MDS	55	50	38-57	46.04	3.6809	7.9951
PDS	55	50	42-55	47.36	3.2561	6.8753
Gel	147	51	131-153	142.75	4.9673	3.4798
TiI	201	50	175-206	186.70	7.0138	3.7567
TaI(L)	154	50	129-155	144.16	5.8322	4.0457
TaI(H)	18	50	16-22	18.60	1.3401	7.2049
TiI/Gel	1.37	49	1.17-1.39	1.3018	0.0491	3.7719
GelI	140	51	122-142	131.06	5.0296	3.8376
TiII	174	51	156-182	169.14	5.5462	3.2791
TaII(L)	147	51	131-151	140.43	4.1533	2.9576
TaII(H)	18	51	16-21	18.59	1.0035	5.3987
TiII/GelII	1.24	51	1.19-1.35	1.2906	0.0418	3.2374
GelII	157	50	140-165	151.10	5.8910	3.8988
TiIII	259	51	240-279	255.96	9.7118	3.7942
TaIII(L)	156	51	137-164	152.84	5.5834	3.6531
TaIII(H)	16	51	14-18	16.35	0.9343	5.7134
TiIII/GelIII	1.65	50	1.58-1.86	1.6942	0.0615	3.6309
AW/ISD	1.19	39	1.03-1.44	1.1941	0.0857	7.1750
ISD/A-P	1.36	41	1.16-1.53	1.3159	0.0814	6.1857
AW/A-P	1.51	38	1.30-1.86	1.5621	0.1211	7.7539
StI	29	28	27-38	31.43	3.7061	11.7923
CxI	49	40	37-58	49.75	4.1618	8.3654
LatCxI	38	48	26-40	34.94	3.1244	9.1560
MedCxII	45	42	36-53	45.19	3.1487	6.9675
LatCxIII	33	42	25-38	32.07	3.6519	11.3867
MedCxIII	49	41	36-49	43.78	3.4894	7.9701
TiI/AW	2.96	42	2.46-3.05	2.7305	0.1491	5.4640
TiII/AW	3.81	43	3.35-4.26	3.7614	0.2244	5.9670
AW/AL	1.26	28	1.20-1.97	1.4218	0.1881	13.2264
AL/AAS	1.54	29	0.97-1.62	1.3500	0.1498	11.0988

*For maxima of these setae

pointed, with a few setules. Lateral coxala II curved, blunted, lightly setulose, lateral III similar; medial coxalae II, III as described for coxala I.

Legs normal; lengths (including coxae and claws): I 790, II 750, III 915.

Leg specialized sensory setae (lengths in parentheses): SoGeI.85d(36), VsGeI.90pd(5), SoTiI.65d(60), CpTiI.73d(7), SoTiI.74d(55),

VsTiI.87pd(5), VsGeII.92pd(5), SoTiII.07d(51), SoTiIII.79d(27), SoTiIII.06d(50).

Tarsus I with SoTaI.33d(48); long, tapering, pointed. Tarsus II with SoTaII.43d(31), terminally expanding a little, blunted. Tarsal claws as for genus, all falciform. The posterior tarsal claw is somewhat obtusely-angled about halfway along, with a few ventral setules.

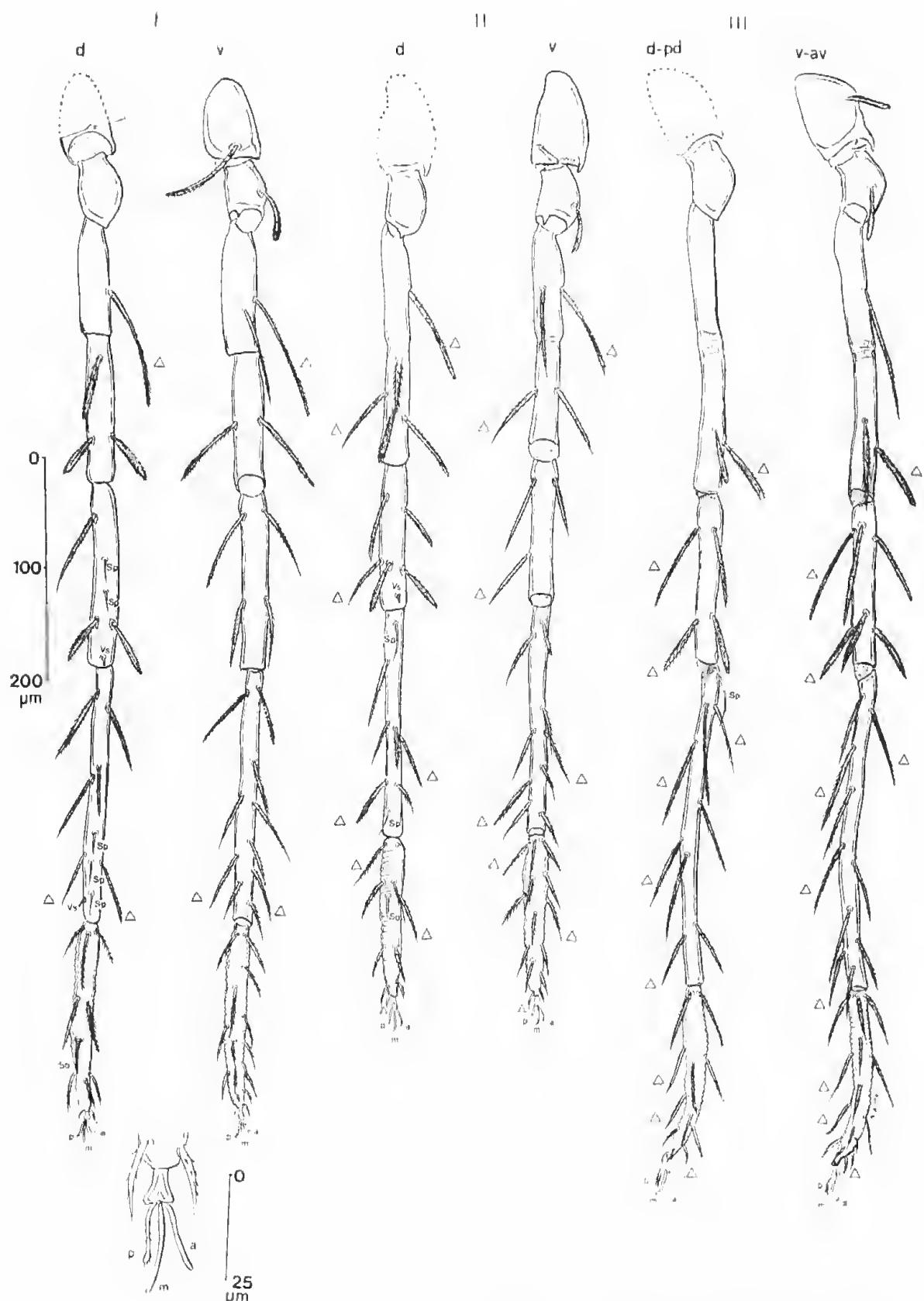


FIGURE 5. *Leptus torresianus* sp. nov., larva, holotype. Legs I, II, III, to standard symbols. Inset: tip of tarsus I, dorsal view. The symbol Δ indicates that the seta is shown in both drawings of the leg or other structure. a, m, p indicate anterior, middle and posterior tarsal claws, respectively. Vs vestigiala. So is used for tarsal solenoidala, Sp for other leg solenoidala (spinala), as in author's terminology.

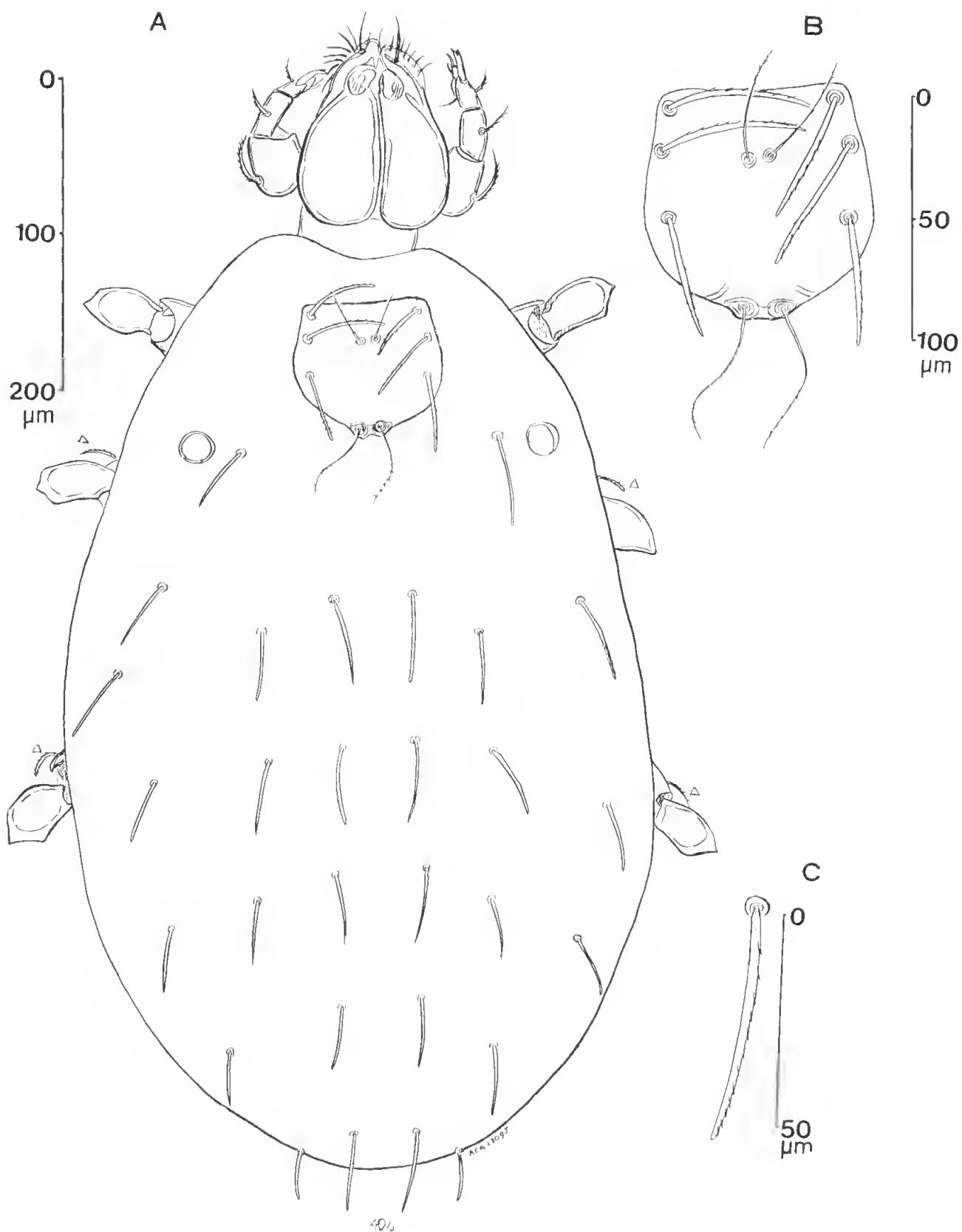


FIGURE 6. *Caeculisoma mouldsi* sp. nov., larva, holotype. A, dorsal view, legs omitted beyond trochanters. B, dorsal scutum. C, dorsal idiosomal seta. (Each to nearest scale.)

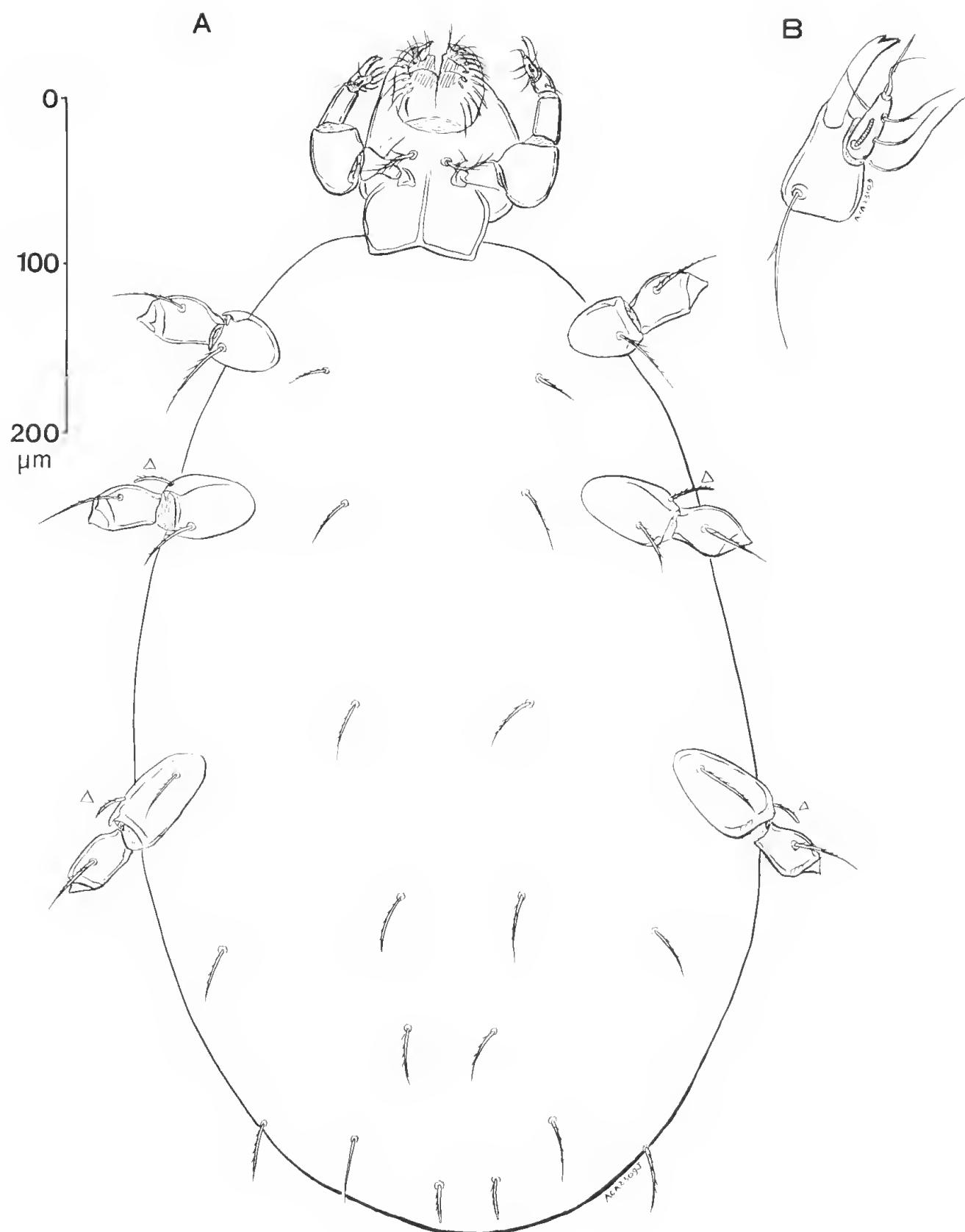


FIGURE 7. *Caeculisoma mouldsi* sp. nov., larva, holotype. A, ventral view, legs omitted beyond trochanters. B, palpal tibia and tarsus, ventral view, from paratype ACA2310D (not to scale).

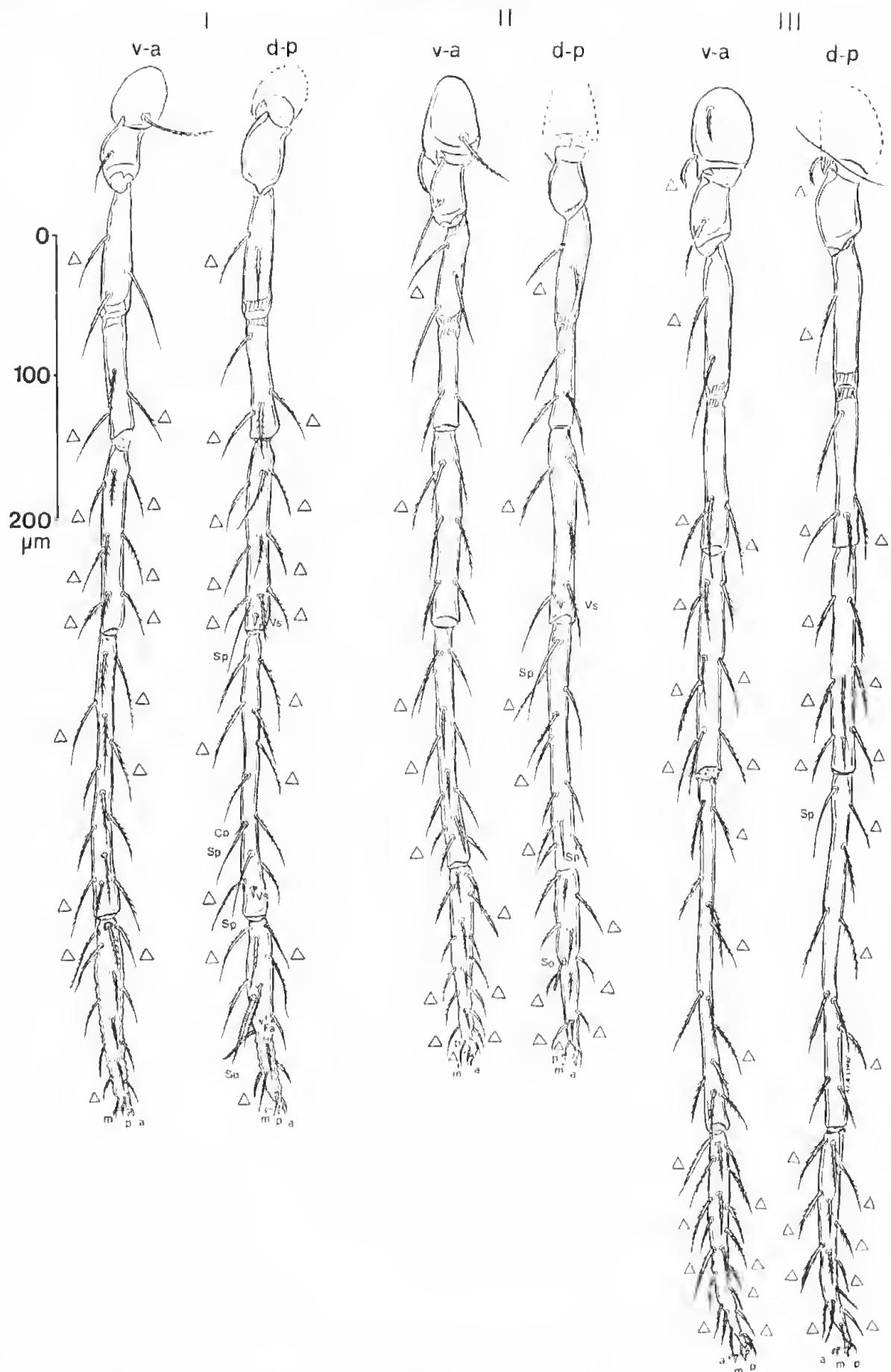


FIGURE 8. *Caeculisoma mouldsi* sp. nov., larva, holotype. Legs I, II, III, to standard symbols, as in Fig. 5; Cp companula; Fa famala.

Gnathosoma: cheliceral bases pyriform, smooth, 120 long by 93 wide (combined). Galeala smooth, simple, pointed, 27 long. Hypostomata arises anterior to palpal trochanters, 40 long, with several long setules. Palpal setal formula 0, 0, 1, 1, 3, 7. Palpal femorala tapering, pointed, well setulose, c. 42 long. Palpal genuala tapering, pointed, 27 long, with a few setules. Palpal tibialae pointed, with a few setules. Palpal tibial claw bifid, the dorsal tine weak. Palpal tarsus as figured. Gnathosomal supracoxala a blunted peg, 4 long.

Material examined

Holotype: Queensland: C.R.E.B. Road, nr Mt Hemmant, N. of Daintree, 2.i.1984, M.S. & B.J. Moulds, in rainforest, on wing of cicada *Venustria superba* G. & F (A2824), larva N1987197 (ACA-2309J).

Paratypes: Same data as holotype, nine larvae N1987198–N1987206 (ACA2309A–D, H, K–N). Mt Hartley, nr Roseville, S. of Cooktown, 1.i.1984, M.S. & B.J. Moulds, on cicada *Venustria superba* G. & F (A2825), 27 larvae N1987207–N1987233 (ACA-2310A–Z, ZA). Same locality, date and collectors, on cicada A2826 *Tamasa doddi* (G. & F), two larvae N1987234, N1987235 (ACA2312A, B). Same locality, date and collectors, on cicada A2827 *Mardalana suffusa* Distant, nine larvae N1987236–N1987244 (ACA2313A–I). Same locality, date and collectors, on cicada A2829 *Psaltoda fumipennis* Ashton, three larvae N1987245–N1987247 (ACA2314A–C).

Remarks on distribution and taxonomy

Caeculisoma was founded by Berlese (1888: 186) on two adult mites referred to *C. tuberculatum* Berlese, 1888, one collected under decomposing fungi at Buenos Aires, Argentina, and the other

from under tree bark at Asunción, Paraguay. Correlation with the larva was established by Southcott (1961a, b) for the Australian *C. darwiniense* Southcott, 1961. The species are known only from Southern Hemisphere locations, and larvae have been described only from Australia and New Zealand. *C. darwiniense* is known from Northern Territory, Queensland, New South Wales, South Australia and Western Australia, recorded hosts being Acrididae (Orthoptera); *C. cooremani* Southcott, 1972, is known from Western Australia (Acrididae); *C. huxleyi* Southcott, 1972, is recorded from New Zealand, parasitizing *Xanthorhoe* sp. (Lepidoptera: Geometridae). *C. mouldsi* sp. nov. is known only as larvae from a limited area of tropical Australia (Cape York Peninsula), parasitic on cicadas.

For a discussion on the generic classification of the tribe Callidosomatini, see Treat (1985) and Southcott (1988).

In the key to the larvae of *Caeculisoma* (Southcott 1972: 25–26), *C. mouldsi* comes down to caption (3), which may be replaced by:

3 (2) PD setae in range 20–30 μ m long	<i>C. sparnoni</i> Southcott
..... PD setae in range 40–90 μ m long	4
4 (3) PD setae in range 40–60 μ m long	<i>C. mouldsi</i> sp. nov.
..... PD setae in range 70–90 μ m long	<i>C. huxleyi</i> Southcott (New Zealand)

Etymology

The species is named for the collectors.

ACKNOWLEDGMENT

I thank the Australian Biological Resources Study for support.

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